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A PROTECTIVE VALUE STUDY OF THE MIB INQUIRY SERVICE

Richard L. Bergstrom, FSA,MAAA OTR Actuarial Consultant
Milliman & Robertson, Inc.

Stephen A. Freitas Senior Developer MIB, Inc.

Executive Summary
A protective value study of the MIB Inquiry Service was performed by examining applications for life insurance from one representative company over a period of one month. Protective value exists whenever the estimated mortality savings of using the MIB Inquiry Service exceeds the cost of the service. "Savings" is a function of excess impaired mortality, amount applied for, impairment prevalence, test sensitivity, and exclusivity factor of the MIB information. The year-to-year savings was calculated in today's dollars by discounting future excess mortality at 8%, and taking into account reasonable anticipated lapse rates of the policies over time. Conservative assumptions were made in calculating the present value of savings. This was done to reduce any potential "favorable" bias in the savings element. Overall, for all cases examined, the present value of savings was $0.18 per thousand, which yielded a savings-to-cost ratio of $ 46:1 for the portfolio reviewed.

The Theory
There are several ways in which actuaries, underwriters, and medical directors can attempt to quantify the real value of a screening device, be it a laboratory test, an attending physician's statement, a motor vehicle report, etc. Each method invariably includes some form of comparing the cost (of a test) to the savings to be realized from future saved mortality because an impaired risk was not issued a policy at standard rates. As the cost component happens at issue time, but the savings is spread out over future policy years, a present value of savings is calculated. "Protective value" exists whenever savings exceeds cost. When savings equals cost, the quotient of cost divided by savings per thousand is called the Protective Value Threshold (PVT), the underwritten amount of insurance above which the theoretical returns to the company over time exceed the discount rate used to generate the present value of savings.

Assumptions must, of course, be made to complete any such study. So while the theory may be straight forward and correct, the results are only as good as the assumptions contained in the various input parameters. When possible, companies should always use their own real data in the calculations of cost and savings.

The "cost" side of the protective value equation should include at a minimum the direct costs charged to the underwriting department to get the information solicited. This should include such hard dollar costs as collection fees (paramedical), transportation costs (FedEx), and laboratory analysis (if any). However, an estimate of certain soft dollar costs should also be made, such as the time it takes an underwriter or medical director to understand and use the results of the test. Some appropriate hourly charge for their time should be included. Overhead cost allocations should probably not be assumed because they are likely included in other areas of the underwriting budget.

"Savings" requires a number of assumptions, not the least of which is a basic mortality assumption to be used for baseline standard business. A lapse rate and an appropriate discount rate are also needed for the present value calculation. In addition, there are (at least) three other input parameters required: impairment prevalence, sensitivity of the test in question, and the exclusivity factor (sometimes called the "attribution ratio").

An estimate of the degree of substandard mortality assumed is needed to be able to determine how much savings can be expected to be released over the study period, and how fast. The substandard assumption can be simplified if the degree of impairment sought can be expressed as a table rating, a percentage of the underlying basic mortality. Fortunately, this is a common and frequent way of assigning mortality debits.

In general, then, the basic protective value equation looks like this: if

Cost < Savings,

there is indeed value, where Savings here is denoted by

Savings = Excess Mortality x Underwritten Amount x Prevalence x Sensitivity x Exclusivity Factor

or, in symbolic terms,

$$\text{Savings} = EM * U * R * S * T$$

Where

EM = excess mortality savings per $1000 (i.e., present value of excess death benefits)

U = underwritten amount in $1000s

R = impairment prevalence of the population applying for insurance

S = test sensitivity, or how good the test is at finding the truly impaired risks

T = exclusivity, or what weight should be given the test as the only means to uncover or illuminate the impairment

Depending on the test in question, the above calculation can be done for single impairments or multiple impairments. Once the assumptions have been determined, the PVT is determined by dividing Cost by Savings per $1000.

The Approach
During the design phase of this study, the decision was made to develop the protective value information from all the applications where underwriting decisions were made from New England Financial over a period of one calendar month. The choice of one

company ruled out any intercompany biases that could have been introduced into the study. The time frame of one month gave a snapshot of typical insurance activity within the company. It was assumed that the month selected represented New England Financial's insurance business throughout a typical year.

Overall, over 900 applications were examined. The number was sufficiently large so that, by the law of large numbers, the predictability to the entire population was deemed high. In addition, the Central Limit Theorem in statistics dictates that the data will tend toward normality, making the use of traditional statistical techniques an unbiased estimator of true population tendencies.

A total of 179 applications were found to have MIB impairment codes. These cases were examined by an independent underwriter with the intent of estimating the "exclusivity" of the MIB impairment information. For example, if the underwriting investigation was initiated solely from the MIB alert, then exclusivity was rated "high" (=1.0). If the MIB impairment codes added no new information to the underwriting process, then exclusivity was deemed negligible (=0.0). Ratings between 0.0 and 1.0 were assigned based on the underwriter's best estimate of the relative amount of information provided by the MIB alert.

It was decided for purposes of this study to remove all joint cases from analysis. Several other policies were excluded from consideration, usually because of incomplete insured information, so that at the end of this process, there were a total of 877 single policy cases examined for Protective Value, with 145 having MIB information.

For the majority of the cases in this study, the degree of impairment was generally based on an underwriting outcome. There were a total of six underwriting outcomes. The first was "Issued as Applied for", which amounted to 68 of the 145 cases with MIB information. Here the degree of impairment assumed was set to zero. Second, there were 48 cases issued as substandard, which have an impairment score of 25 debits for each table increment so designated. For example, a Table F rating presumes an underlying mortality of 250 percent. If the table designation was missing from the underwriter's impairment comments, then the impairment was considered as Table B, or 50 debits. Twenty-one cases were declined. For these, we assumed mortality equal to 500% of standard.

In this analysis, the test sensitivity (S) was assumed to be 1.0. This means that if the individual applicant in question had previous impairment information within the last seven years on the MIB database, that person would absolutely be found. The MIB search mechanism has historically shown that searching for impairment information on the database for a particular individual by name, date of birth, and place of birth would certainly result in confirmation of such impairment information if it exists.

The Assumptions

Baseline mortality was chosen as 75% of the 1975- 80 Basic Select and Ultimate tables. This was not to suggest that other tables would not be appropriate [in fact, each company should use its own experience if available and credible]. These sex-distinct tables were chosen to represent a blend of overall "standard" mortality today. No attempt was made to use tobacco-distinct mortality. Of the 877 sample cases eventually included in the study, 145 could be classified as single lives with an MIB impairment code. Each case was then "underwritten" to assess the probable degree of impaired mortality using a table rating scheme. Further, the examining underwriter was asked to estimate the exclusivity factor for each case.

Future impaired mortality was calculated over a 20- year period by multiplying the present value of the standard mortality stream by the substandard mortality rating (e.g., Table C = 75% extra mortality). The future excess mortality (PVB) was discounted at 8%. The following lapse rates were also assumed:

Policy Year	Rate (%)
1	15
2	12
3	10
4+	8

PVBs were calculated for quinquennial ages beginning at 0. Savings per $1000 was calculated by multiplying the PVB for each case by the designated exclusivity factor.

Of the 145 cases reviewed because of the MIB code(s) attached to them, 68 were issued as applied for even though the examining underwriter would have rated the case with only the knowledge at hand. These we concluded were "false positives," an indication of the specificity of an MIB inquiry for this case study. Because these policies were ultimately issued without a rating, we concluded that we could assign no value to the finding of the MIB code. There was, however, cost to be considered as the company underwriter would have had to review the case. In fact, we assumed there was a $10 underwriting cost applicable to all 145 such policies. This is in addition to the company-specific average per inquiry cost, which is applicable to all 877 cases in the study. This presented us with a Total Cost of $2099, or a cost per application of $2.39 ($2099/877).

Total Savings was ultimately defined as the sum of the individual savings on the 69 policies that were rated or declined. No value was assigned in this study to the eight policies classified as incomplete, missing or postponed.

Results

For the entire 877 case database, the combined value of the Savings taking into account the actual MIB Activity level is $0.18 per $1000 applied for. This yields a Protective Value Threshold of about $13,000: ((2099/877)/0.18) = $13,000, which is [(cost/total number of applications)/savings per thousand]. The Savings/Cost ratio is the savings in dollars divided by the total cost ($97,286/$2,099 = 46.34), or $46: 1. The details for these calculations are presented in Table 1.

Table 2 summarizes the savings by gender. For females the PV Savings is $0.10/thousand. For the males, the PV Savings is $0.22/thousand.

Table 3 separates male data by amount and age group. For the $100,001 to $499,999 group, the PV Savings for the age 45 and younger cohort is $0.18/thousand, while for the age 46 and older group it is $1.42/thousand. For the higher underwritten amount ($500K+), the PV Savings for the younger group is $0.19, while for the older group it is $0.42. What is interesting about this is that the savings for the age 45 and younger group is basically the same irrespective of size. Where the real savings occur is in the older population males. The difference in savings for the older cohort in the lower amount group is seven times that for the younger group: $1.42 vs. $0.18, while the savings is about double in the higher underwritten amount: $0.42 vs. $0.19. Note that the MIB Activity is twice as high in the older versus younger cohort in both amount groups.

The Present Value Savings is sensitive to extreme or excessive values in any of the variables or components used in the calculation. Therefore, extremes in age, the impairment rating score, underwritten amount of insurance or the exclusivity of the MIB information for an individual can dramatically increase the savings. For example, nine cases out of the 69 used for savings calculations represent 59% of the total savings value. Six cases have an underwriting outcome of declined, which by definition have a high impairment rating score (500% mortality). In addition, one of these six has an exclusivity of the MIB information of 1.0. The remaining three substandard underwriting outcomes with an elevated PV Savings are represented by a 69-year-old; a person with a large policy size (in excess of $4 million); and a person with a combination of an elevated age (53) and a large policy (around $1 million). Further, the average exclusivity factor for the policies studied was gauged at about 0.2, or no more than 20%. In markets where the inquiry system might be the ONLY mechanism of alerting an underwriter of potential antiselection, the exclusivity can increase dramatically (note that costs will increase in this case as well).

Conclusions

Overall the Present Value (PV) Savings is $0.18 per thousand. This gives a Savings/Cost ratio of 46: 1.

The Protective Value for Cotinine testing, as referenced in the article "Adding it Up" from the *Underwriter Alert*, September 1996 issue, is $0.23 per thousand for those individuals 35 years old. Since this $0.23 estimate includes a "Sentinel Effect," the $0.18 per thousand number compares favorably since the Sentinel Effect is not taken into account.

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About the Author

Richard L. Bergstrom, FSA, MAAA, is OTR's Actuarial Consultant. He is with Milliman & Robertson, Inc., Seattle, WA. Rick may be reached at rick.bergstrom@milliman.com.

Steve Freitas is a Senior Developer for the Knowledge Services Group of MIB, Inc. He has been employed at MIB for approximately one year. Prior to joining MIB, Steve held various senior level statistical positions working in support of the development of medical devices, polymer chemical products, US Army soldier protective equipment, and as a Public Health statistician. He received his statistical training and holds a Master's degree from the University of Pittsburgh, Graduate School of Public Health, and an undergraduate degree in Biology from Springfield College in Massachusetts. Steve lives in a small suburban town outside of Boston, Massachusetts, with his wife and 12-year-old daughter.

Table 1

Summary of Base Calculations

	Total
Savings in Dollars	$97,286
Sample Size Used in Savings Calculations	69
Total MIB-related Cost	$2099
Total Number in Study	877
Sample Available	145
Median Age	44
Actual MIB Activity Level	16.5%
Cost per Application	$2.39
Actual PV Savings per Thousand Based on MIB Activity	$0.18
PV Threshold, Thousands	$13
Savings/Cost	46:1

Table 2

Summary of Base Calculations Separated by Sex

	Females	Males
Savings in Dollars	$15,064	$82,222
Sample Size Used in Savings Calculations	11	58
Total MIB–related cost	$573	$1526
Total Number in Study	340	534
Sample Available	32	113
Median Age	44	45
Actual MIB Activity Level	9.4%	21.2%
Cost per Application	$1.68	$2.86
Actual PV Savings per Thousand Based on MIB Activity	$0.10	$0.22
PV Threshold, Thousands	$16	$13
Savings/Cost	26:1	54:1

Table 3
Summary of Base Calculations
Separated for Males by Amount and Age
For Policies with Underwritten Amount in Excess of $100,000

	Age 45 or less 101K to 499K	Age 46 + 101K to 499K	Age 45 or less 500K+	Age 46 + 500K+
Savings in Dollars	$7,010	$22,800	$22,301	$25,839
Sample Size Used in Savings Calculations	12	12	15	13
Total MIB–related Cost	$377	$264	$358	$284
Total Number in Study	158	59	105	46
Sample Available	26	22	28	25
Actual MIB Activity Level	16.5%	37.3%	26.7%	54.4%
Cost per Application	$2.39	$4.47	$3.41	$6.17
Actual PV Savings per Thousand Based on MIB Activity	$0.18	$1.42	$0.19	$0.42
Protective Value Threshold, Thousands	$13	$3	$18	$15
Savings/Cost	19:1	86:1	62:1	91:1